CASE 9.—Adult man, supposed to be suffering from commencing locomotor ataxia.

Date.	Dose.	Pulse and respiration.	Remarks.
9.6 12 M.	gr. j. mor.	12 noon, temp. 99°, pulse 72, resp. 25; 1.30 P.M. temp. 97°, pulse 60, resp. 17; 6 P.M. temp. 97°, pulse 60, resp. 20	He went to sleep directly after receiving injection, and slept an hour and twenty minutes. Was drowsy all afternoon and evening. No vomiting.
9.8 12 M.	gr. j. mor. 1-40 gr. atr.	12 noon, temp. 99°, pulse 70, resp. 20; 2 P.M. temp. 97°, pulse 70, resp. 20	He went to sleep at once, and slept a little over two hours; did not feel sleepy again until after supper. Mouth dry; face flushed; felt burning heat through body.
9.9 11.30 P.M.	1-40 gr. atr.	11.30 P.M. temp. 98°, pulse 56, resp. 24; temp. 98°, pulse 68, resp. 22	He went asleep and slept three hours. The face at 2 P.M. was a good deal flushed, but not more so than the day before. Mouth very dry. Trembling, with disordered vision and diplopia.

CASE 10.—Adult man, with pneumonic phthisis.

Date.	Dose.	Pulse and respiration.	Remarks.
9.15 12 M.	gr. j. mor.	12 noon, pulse 72, resp. 24; 2 P.M. pulse 67, resp. 16	At 2 he had slept ever since the injection, an unnatural dreamy sleep, with phantasms. Slept until 4 P.M.; did not go asleep after this until 1.30 A.M.
9.16 12 M.	gr. j. mor. 1-50 gr. atr.	12 noon, pulse 60, resp. 22; 2 P.M. pulse 72, resp. 20; 7 P.M. pulse 60, resp. 20	At 2 P.M. had not slept any; vision good; pupils natural; slight thirst; face not flushed, although it had been; tongue moist; slept two hours after this.
9.19	¼ gr. mor.	2 P.M. pulse 80, resp. 31; 4 P.M. pulse 48 full, resp. 23	By voluntary effort kept himself awake through the afternoon and evening. Pupils were much contracted all afternoon and evening. Marked dizziness. He vomited his supper.
9.20 12 M.	½ gr. mor. 1-40 gr. atr.	12 noon, pulse 68, resp. 26; 2 P.M. pulse 86, resp. 22	As yesterday, except that the pupils were dilated rather than contracted, and the dizziness was not so marked; also he did not vomit.

ART. IV.—*Method of Using Strychnia in the Treatment of Optic Nerve Atrophy and Allied Nervous Affections.* By JULIAN J. CHISOLM, M.D., Clinical Professor of Eye and Ear Diseases in the University of Maryland, and Surgeon in Charge of the Baltimore Eye and Ear Institute.

IT is now nearly two years since I commenced experiments hypodermically with strychnia, for the relief of dimness of vision, in cases of optic nerve atrophy. With the usual timidity of one dealing knowingly with a substance of great potency, I deemed it prudent to commence the series of experiments with doses so small as to be incapable of serious injury to even those whose system may show an idiosyncrasy, a rebellious spirit, against strychnia. Of a solution of the sulphate of strychnia 4 grs. of the salt and distilled water ℥j, 3 minims, containing the $\frac{1}{40}$ of a grain, was the amount first introduced under the skin. It was presumed that strychnia would act as did morphia, with which the system seems most readily impressed by the hypodermic administration. In using a solution of the strength indicated it was an easy and safe method of watching the effects of increasing doses, as they could be added to drop by drop, and the increase suspended as soon as any toxic effects should show themselves.

Experience with observation soon showed that the human system rapidly tolerates strychnia, and that a dose which would cause decidedly uncomfortable contraction in the spinal and leg muscles, would after a few repetitions cease to annoy. Through this tolerance it was discovered that in every case the dose could be safely increased to a point far beyond the customary amount administered by general practitioners; even in the cases in which very small doses had in the beginning produced very uncomfortable symptoms. It was also observed that the ordinarily administered dose of from $\frac{1}{60}$ to $\frac{1}{30}$ of a grain of the sulphate of strychnia, which would at first be felt by the patient, when repeated three times a day, was comparatively useless, giving but negative effects in nerve atrophy, on account of the smallness of the dose. This small quantity causes no appreciable stimulation.

My experience led me to the conclusion that to obtain all the good that strychnia could produce, it was necessary to keep the system under the full physiological effects of the remedy by administering a dose as large as the patient could bear comfortably, and that a smaller dose would not answer. I also observed that when the tolerance of the remedy was fairly established very few patients could take more than one-half of a grain of the sulphate of strychnia daily, but that this quantity could be well borne by most persons. Under these doses there seemed to be a constant excitation sustained to the permanent benefit of the patient.

When it was found that strychnia could be introduced under the skin in doses so much larger than those ordinarily administered, an effort was made to create an impression that similar doses could not be taken into the stomach with the same impunity, and that strychnia differed from all other remedies hypodermically used. These, as we well know, are more active when hypodermically used, and consequently must be more guardedly given by the skin injection.

To test this important point I alternated with the same patient, dose with dose, giving at one time hypodermically, and at another by the mouth, a similar quantity from the same bottle. I found that the same quantity when injected would act a little more promptly than when administered by the mouth, but that, except the difference in time, a few minutes only, there was no other appreciable difference in the effects. I, however, discovered that a similar dose was not equally borne at all times of day. A larger dose could be taken after eating than after fasting; in the one case, the medicine commingling with the food, absorption must be slow and gradual; whilst the whole amount dissolved in a little water, when brought in contact with the walls of the empty stomach, would be much more rapidly taken up. I also observed that the dose in the morning may be larger than that at mid-day, and this again than the dose of the evening; that is to say, that when the system tolerates one-fifth of a grain of the sulphate of strychnia after breakfast, followed by very little, if any, stiffening of the limbs, the same dose when repeated after dinner will be followed by a great deal more bracing of the muscles, and when repeated after tea for the third time during the day, it is very apt to bring on a very uncomfortable tetanic condition, which may last for one or two hours.

An explanation for these phenomena is sought for in the cumulative effects of the drug. It enters the system with much greater rapidity than it can be gotten rid of, its elimination being slow. When one-fifth of a grain of the sulphate of strychnia is taken after breakfast, the blood soon becomes charged with the salt, and in from twenty to sixty minutes the whole dose seems to have been taken into the circulation, affecting the nerve centres with the greatest force. The eliminating organs commence at once their work of straining it out of the circulation, and in a couple of hours, provided the dose be not toxic, a certain amount of the remedy is gotten rid of, which so far reduces the dose as to remove the disagreeable effects, but a quantity of the drug still remains in the blood, and the process of elimination is still to go on. When the after-dinner dose is taken, there is still some of the previous dose not yet eliminated from the circulation. To this the dose rapidly absorbed is soon added, making in this way a larger dose than the one believed to have been administered, and with therefore increased effects. Now, when the third dose is taken after supper, the cumulative effects of this entire dose, with possibly one-half of the dinner portion still in the circulation, impresses the nerve centres to such a decided extent as to produce the very distressing, although transient, spasms of the back and leg muscles. By morning again, fully twelve hours having elapsed, the eliminating organs, incessantly at work, have had time to expel from the system the entire amount received into the circulation on the preceding day. Therefore the large dose is again well borne at breakfast time, the evening dose repeating the discomfiture of the preceding day.

Finding by a very large experience that large doses of strychnia are required to effect beneficially the system in cases of deficiency in nerve action, and that a large dose when taken by the mouth will produce the identical, immediate, and final results, as when taken under the skin, I have abandoned the hypodermic use of the remedy, inasmuch as the sticking with the small canulated trocar was not a pleasant anticipation, and would become from day to day more annoying, especially when kept up for months.

The intense bitterness of the strychnia which remains in the mouth for a long time after it is taken, can be avoided by giving the remedy in pill form, especially in sugar-coated granules. These I have frequently tested by comparing their effects with a liquid solution of the salt, accurately measured in a minim glass. I find them strikingly similar.

When strychnia is given in large doses in solution, it is not safe to trust to the teaspoon measure as used in different households. Many teaspoons will hold nearly two drachms, instead of the one drachm in which the proper dose of the remedy has been dissolved. Very dangerous effects might ensue when the physician is prescribing one-fifth of a grain of strychnia to the drachm, and the patient has administered to him over one-third of a grain to the teaspoonful. Hence I find the sugar-coated granules of fixed proportions a much safer means of administration. Again, if a patient with defective vision has to measure his own dose of this strong solution, there will be much less responsibility in trusting him to count pills than to measure a teaspoonful of a liquid preparation.

I have, for some months, restricted the administration of strychnia to the use of sugar-coated strychnia granules, as carefully prepared by Bullock & Crenshaw, or by Warner & Co., and others. I use granules of $\frac{1}{30}$, $\frac{1}{20}$, $\frac{1}{15}$, $\frac{1}{10}$ of a grain of strychnia each. With these combinations I can with every caution gradually increase the dose from day to day. I usually commence with a $\frac{1}{30}$ of a grain granule, to be given three times a day, after meals. I commence with this small dose to guard against idiosyncrasies. If no discomfort follows upon their administration, after a few days the strength of the dose is increased by substituting a pill of $\frac{1}{20}$ of a grain each. When these are well borne, granules of $\frac{1}{15}$ of a grain are prescribed; and in a short period, often in from ten to fifteen days, granules of $\frac{1}{10}$ of a grain of strychnia can be safely taken. The next increase made is to give two granules of $\frac{1}{15}$ grain each, which will be equivalent to $\frac{1}{7\frac{1}{2}}$ of a grain; and, finally, two granules of $\frac{1}{10}$ of a grain each, can be administered as a dose. When these heavy doses are being used, I find it expedient to make the night dose light. For instance, when two of the $\frac{1}{15}$ or $\frac{1}{10}$ granules can be taken after breakfast, and even after dinner, with comfort, the patient avoids the annoying effects of an overcharged circulation with strychnia, by taking only one pill at bedtime. By this arrangement he takes the $\frac{1}{2}$ grain of strychnia per day, which, according to my experience, is the dose that produces the best remedial effects. When these large doses have secured a tolerance in the system, they may be safely continued for months, or as long as they seem to benefit, and may be still further increased should they cease to excite the nerve centres. Whatever good accrues during the administration of the strychnia will be permanently retained. In no instance, as far as my experience extends, have I found the improvement lost when the use of the strychnia is discontinued.

ART. V.—*On the Treatment of various forms of Amblyopia and Amaurosis.* By CHARLES S. BULL, M.D., Assistant Surgeon to the Manhattan Eye and Ear Hospital, Pathologist to the Presbyterian Hospital; New York.

LONG before the invention of the ophthalmoscope, and when ophthalmologists knew nothing of the pathological changes in the fundus of the living eye, strychnia had been employed empirically in the treatment of certain forms of amaurosis which were regarded as actual paralyses of the retina or optic nerve, but the reports of these cases have been transmitted to us in such an inexact and incomplete condition, that we can place no reliance on the correctness of the observations. Nagel, in his recent work (*Die Behandlung der Amaurosen und Amblyopieen mit Strychnin*, Tübingen, 1871), has given a very complete historical account of the employment of the drug, and says that Magendie attributes the honour of having first used it to Edwards, who employed the alkaloid in 1821 in a case of amaurosis with paralysis of the upper eyelid. Nagel thinks that the merit of having first instituted a series of successful experiments is due to Thomas Shortt, of Edinburgh. Shorrt's observations were very careful and exact, though he was rather working in the dark, as far as means of diagnosis were concerned. He employed strychnia externally by covering the raw surface of an opened blister with the powdered drug, and claims to have seen very marked improvement in the cases thus treated. Shortt thought that the strychnia acted solely as an irritant, either upon the nerves themselves or upon their capillaries, and could therefore only be employed successfully in those cases of amaurosis which depended upon paralysis of the optic nerve or retina, or in cases of congestive amaurosis, where pressure is caused by the distended capillaries of the neurilemma. In cases, however, of structural changes in those tissues, in long-continued inflammatory action or atrophy of the medullary portion of the nerve, there was nothing to be expected from the use of the drug. How true these remarks are will be seen later on. Other observers, not satisfied with the effects produced by the dry powder, employed an ointment of such strength as to admit of applications of from gr. $\frac{1}{5}$ to gr. $\frac{1}{2}$ twice a day. The most successful results from this method were obtained by Miguel and